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CLAIMS

1. A method of forming a detector-arrangement in co-action with a gas sensor and intended for detecting electromagnetic waves, such as infrared light rays, passing through a gas cell (2), wherein said gas cell defines a cavity (21) which can enclose a volume of gas (G) to be measured or evaluated, wherein a surface, or parts of a surface, that form wall-parts (21C, 21D, 21E) within said gas cell (2) or cavity (21) is/are covered with one or more different metal layers with the intention of forming a surface which is highly reflective with regard to said electromagnetic waves, and wherein said detector (3) is a thermal element formed onto an electrically non-conductive base structure; having a topographical structure; covered with a first electrically conductive metal layer and a second electrically conductive metal layer which are arranged to form said thermal element, each of said first and second electrically conductive metal layer is applied to said surface structure at an angle of incidence other than 90°, **characterised** in that a part or section (2B) of said base structure (B) is caused to expose said topographical structure and forms one part of said gas cell (2), that a second or further part (2A) is formed to enclose said cavity (21) and adapted to cover said part (2B) having said topographical structure and that a base structure related area outside said topographical structure is used for circuit arrangements and/or discrete components (1a, 1b and 3).

2. A method according to Claim 1, **characterised** in that said thermal element is enclosed by said second part (2A) and a light generating means (1a) and a light receiving means (3) are arranged adjacent and outside said second part (2A).

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3. A method according to Claim 1, **characterised** in that one surface region or surface regions of said topographical structure is/are coated with a electrically conductive metal layer; in that a first metal layer is applied to the surface structure at a first angle of incidence other than 90°; in that said second metal layer is applied to said surface structure at a second angle of incidence other than 90° and different to said first angle, and in that said first and said second metal layers are caused to overlap each other within discrete surface parts of said detector.

4. A method according to Claim 3, **characterised** in that said first metal layer and said second metal layer comprise of metals which provide the function of a thermocouple at said discrete surface parts of said detector.

5. A method according to Claim 1, ~~2 or 3~~, **characterised** in that said detector is produced onto a limited surface region; and in that electric conductors and/or electric circuits and/or electronic circuits are formed on said limited surface region in the same way.

6. A method according to Claim 5, **characterised** in that said base unit is produced by a topographical shaping operation, such as a moulding, pressing or embossing operation, against a die or mould that exhibits a complementary topographical structure; in that at least a part of said mould, corresponding to said detector, is produced by an electrode plating process or like process against a model that includes a topographical structure adapted with respect to said detector; in that said model is produced by micromechanically working a substrate, such as a silicon substrate; and in that the topographical structure and/or the configuration of said model is chosen to correspond to desired detector-associated surface parts, electric conductors, and/or electric and/or electronic circuits.

7. A method according to Claim 5, **characterised** in that said base unit is produced by a shaping operation, such as a moulding, pressing or embossing operation, against a die or mould that has a complementary topographical structure; in that at least a part of said mould corresponding to said detector is produced by micromechanically working a substrate, such as a silicon substrate; and in that the topographical structure and/or the configuration of said substrate is complementary with respect to desired detector-associated surface parts, electric conductor paths, and/or electric and/or electronic circuits.

8. A method according to Claim 1, **characterised** in that parts of said base unit related structure is applied to a surface part on the inside of said second cell part.

9. A method according to Claim 1, , **characterised** in that said base part is comprised of a part integral with said first cell part; and in that said detector-associated surface parts form a part of the inner surface of said cavity.

a 10. A method according to Claim 1, ~~3~~, ~~8~~ ~~or 9,~~ **characterised** in that cavity-associated surface sections are coated at the same time as detector-associated surface parts, and with the same metal.

a 11. A method according to Claim 1 ~~or 3,~~ **characterised** in that said topographical structure is adapted to provide requisite connection pads belonging to said detector, electric conductors, and/or electric and/or electronic circuits.

a 12. A method according to Claim 8 ~~or 9,~~ **characterised** in that electric conductors and/or electric and/or electronic circuits are formed in said second cell part.

Amended Sheet

13. A method according to Claim 3, **characterised** in that the topographical structure belonging to said detector-associated surface part includes a number of so-called conductive ridges; in that said conductive ridges have a first side surface, a second side surface, and an upper surface; in that a so-called conductive surface is located between two adjacent conductive ridges; in that said first angle is adapted so that said first side surface and at least a part of said upper surface of respective conductive ridges, and at least a part of said intermediate conductive surfaces are coated by said first metal layer; in that said second angle is adapted so that said second side surface and at least a part of said upper surface of respective conductive ridges, and at least a part of said intermediate conductive surfaces, are coated with said second metal layer; in that said first and second angles are adapted so that said second metal layers overlap and form an electric contact with said first metal layer on the upper surface of respective conductive ridges and on the intermediate conductive surfaces, such that said metal layers form a series of electrically interconnected junctions between said first and said second metal layers.

14. A method according to Claim 13, **characterised** in that said detector-associated surface parts are positioned relative to incident light rays, or electromagnetic waves, such that said incident light rays will irradiate said upper surface of respective conductive ridges, and such that said intermediate conductive surfaces will be shaded against incident light rays by said conductive ridges.

15. A method according to Claim 13, **characterised** by electrically insulating surface sections formed between said conductive ridges, with said intermediate conductive surfaces, and surrounding surface sections belonging to said base unit.

16. A method according to Claim 15, **characterised** in that said electric insulation is achieved by positioning so-called insulating ridges with adjacently located so-called insulating surfaces relative to each other and relative to said conductive ridges and also relative to said first and said second angles, such as to exclude a coating of both said first and said second metal layers on said insulating surfaces.

17. A method according to Claim 13, **characterised** in that said conductive ridges are given a configuration which forms n-number of conductive ridges designated column 1, column 2 and so on up to column "n", wherein respective columns include m-number of conductive ridges designated ridge 1, ridge 2 and so on up to ridge "m", wherein "m" may be different in respective columns; in that the first ridge in each column, with the exception of the "n"th column, and the "m"th ridge in each column with the exception of the last column, form interconnecting ridge, wherein the "m"th ridge in each column, with the exception of the last column, is connected electrically to the first ridge of the next following column; and in that the resultant junctions between said first and said second metal layers belonging to all conductive ridges in all columns form said series of electrically interconnected junctions.

18. A method according to Claim 17, **characterised** in that the electrical interconnection between an "m"th ridge in a column and a ridge 1 in an adjacent column is achieved by forming an electrically conductive surface section between said adjacent columns; and in that said conductive surface section is connected electrically to interconnecting ridges belonging to said adjacent columns but is insulated electrically in other respects from said adjacent columns.

19. A method according to Claim 13, **characterised** in that the series of conductive ridges form a series-connected ther-

mocouple; in that the intermediate layer on a first or a second side surface of a first conductive ridge, or a conductive surface adjacent to said first conductive ridge, in said series of conductive ridges, form a first thermocouple connecting electrode; and in that a first or a second side surface of a last conductive ridge or a conductive surface adjacent said last conductive ridge in said series of conductive ridges forms a second thermocouple connecting electrode.

20. A method according to Claim 13, **characterised** in that said upper surface of respective conductive ridges is covered with a heat absorbing layer; and in that said intermediate conductive surfaces are covered with a heat-reflecting layer.

21. A method according to Claim 20, **characterised** in that said heat absorbing layer is comprised of carbon; and in that said heat-reflecting layer is comprised of said metal layer(s).

22. A method according to Claim 14, **characterised** in that the metal in one of said two metal layers has a first reflection coefficient in relation to said light rays, or electromagnetic waves, that the metal in the other of said two metal layers has a second reflection coefficient in relation to said light rays, or electromagnetic waves, and that said detector-associated surface parts are positioned relative to incident light rays, or electromagnetic waves, so that the metal with the lowest reflection coefficient of said two reflection coefficients is the metal covering the side surface that will face said incident light rays, or electromagnetic waves.

23. A method according to Claim 13, **characterised** in that the metal in said first metal layer differs from the metal in said second metal layer, such as to obtain a thermoelectric effect between said first and said second metal layers.

24. A method according to Claim 22 ~~or 23,~~ **characterised** in that said two metal layers are comprised of gold covering chromium.

25. A method according to Claim 1, **characterised** in that said first cell part includes a surface section intended for two or more different detectors.

26. A method according to Claim 1 ~~or 21,~~ **characterised** in that said second cell part has a surface section intended for two or more detectors.

27. A method of forming a Bolometer related detector-arrangement intended for detecting electromagnetic waves, such as infrared light rays, wherein a cavity (21), which can enclose a volume of gas (G) to be measured or evaluated, have a surface, or parts of a surface, that form wall-parts (21C, 21D, 21E) within said cavity (21) covered with one or more different metal layers with the intention of forming a surface which is highly reflective with regard to said electromagnetic waves, and wherein said detector (3) is formed onto an electrically non-conductive base structure; having a topographical structure; covered with an electrically conductive metal layer, **characterised** in that a part or section (2B) of said base structure (B) exposes said topographical structure and forms one part of said cavity (21), that a second or further part (2A) is formed to enclose said cavity (21) and adapted to cover said part (2B) having said topographical structure and that a base structure related area outside said topographical structure is used for circuit arrangements and/or discrete components (1a, 1b and 3).

28. A detector-arrangement (3) in co-action with a gas sen-

sor (1) and intended for detecting electromagnetic waves, such as infrared light rays, passing through a gas cell (2), wherein said gas cell defines a cavity (21) which can enclose a volume of gas (6) to be measured or evaluated, wherein a surface, or parts of a surface, that form wall-parts (21C, 21D, 21E) within said gas cell (2) or cavity (21) is/are covered with one or more different metal layers with the intention of forming a surface which is highly reflective with regard to said electromagnetic waves, and wherein said detector is a thermal element, formed on an electrically non-conductive base structure having a topographical structure covered with a first electrically conductive metal layer and a second electrically conductive layer which are intended to form said thermal element, each of said first and second electrically conductive metal layer is applied to said surface structure at an angle of incidence other than 90°, **characterised** in that a part or a section (2B) of said base structure (B) exposes said topographical structure and forms one part of said gas cell (2), that a second or further part (2A) is formed to enclose said cavity (21) and adapted to cover said part (2B) having said topographical structure and that a base structure related area outside said topographical structure is used for circuit arrangements and/or discrete components (1a, 1b and 3).

29. A detector according to Claim 28, **characterised** in that said thermal element is enclosed by said second part (2A) and a light generating means (1a) and a light receiving means (3) are arranged adjacent and outside said second part (2A).

30. A detector according to Claim 28, **characterised** in that the a surface region or surface regions of said topographical structure is/are coated with a second electrically conductive metal layer; in that said first metal layer has been applied to surface structures at a first angle of incidence other than 90°; in that said second metal layer has been applied to

said surface structures at a second angle other than 90° and different to said first angle of incidence, wherewith said first and said second metal layers mutually overlap within discrete detector-associated surface parts.

31. A detector according to Claim 28, **characterised** in that said first and said second metal layers are comprised of metals which provide the function of a thermocouple at said discrete detector-associated surface parts.

a 32. A detector according to Claim 28, ~~29 or 30~~, **characterised** in that said detector is formed within a limited surface area; and in that electrical conductors and/or electrical circuits and/or electronic circuits have been provided in said limited surface area in the same way.

33. A detector according to Claim 32, **characterised** in that said base structure has been produced by a topographically shaping process, such as a moulding, pressing or embossing process against a die or mould that has a complementary topographic structure; in that at least a part of said die or mould that corresponds to said detector is produced by electroplating or like process on a model having a topographic structure adapted to said detector; in that said model is produced by micromechanically working a substrate, such as a silicon substrate; and in that the topographic structure and/or the configuration of said model is chosen to correspond to desired detector-associated surface parts, electric conductor paths, and/or electrical and/or electronic circuits.

34. A detector according to Claim 32, **characterised** in that said base structure has been produced by a shaping operation, such as a moulding, pressing or embossing operation, against a die or mould that has a complementary topographic structure or configuration; in that at least a part of said die or

mould that corresponds to said detector is produced by micro-mechanically working a substrate, such as a silicon substrate; and in that the topographical structure and/or the die or mould for said substrate is complementary in relation to desired detector-associated surface parts, electric conductor paths, and/or electrical and/or electronic circuits.

35. A detector according to Claim 32, **characterised** in that said base structure is applied to a surface section of said second cell part.

36. A detector according to Claim 28, , **characterised** in that said base structure forms an integral part of said first cell part; and in that said detector-associated surface parts form an integral part of the inner surface of said cavity.

37. A detector according to Claim 35 ~~or 36~~, **characterised** in that cavity-associated surface sections are coated at the same time as the detector-associated surface parts and with the same metal.

38. A detector according to Claim 28, **characterised** in that said topographical structure is adapted to provide requisite connection pads belonging to said detector, electric conductor paths, and/or electric and/or electronic circuits.

39. A detector according to Claim 35 ~~or 36~~, **characterised** in that electric conductor paths and/or electric and/or electronic circuits are formed in said second cell part.

40. A detector according to Claim 30, **characterised** in that said topographical structure belonging to said detector-associated surface part includes a number of so-called conductive ridges; in that said conductive ridges have a first side surface, a second side surface and an upper surface; in that an intermediate so-called conductive surface is located

between mutually adjacent conductive ridges; in that said first angle is adapted so that said first side surface and at least a part of said upper surface of respective conductive ridges, and at least a part of said intermediate conductive surface, is coated with said first metal layer; in that said second angle is adapted so that said second side surface and at least a part of said upper surface of respective conductive ridges, and at least a part of said intermediate conductive surface, is coated with said second metal layer; in that said first and said second angles are adapted so that said second metal layers will overlap and provide electric contact with said first metal layer on said upper surface of respective conductive ridges and on said intermediate conductive surfaces, such that said metal layers form a series of electrically interconnected junctions between said first and said second metal layers.

41. A detector according to Claim 40, **characterised** in that said detector-associated surface parts are positioned relative to incident light rays, or electromagnetic waves, so that said incident light rays will irradiate said upper surface of respective conductive ridges and such that said conductive ridges will shadow said intermediate conductive surfaces against said incident light rays.

42. A detector according to Claim 40, **characterised** in that electrically insulated surface sections are formed between said conductive ridges, with said intermediate conductive surfaces, and surrounding surface sections of said base structure.

43. A detector according to Claim 42, **characterised** in that said electrical insulation can be achieved by positioning so-called insulating ridges having adjacent so-called insulating surfaces relative to each other and relative to said conductive ridges and also relative to said first and said second

angle such as to exclude application of both said first and said second metal layers on said insulating surfaces.

44. A detector according to Claim 40, **characterised** in that said conductive ridges are configured to form n-number of columns of conductive ridges, said columns being designated here as column 1, column 2 and so on up to column "n", and where respective columns include m-number of conductive ridges, where said ridges are designated ridge 1, ridge 2 and so on up to ridge "m", where "m" can be different for respective columns; in that the first ridge in each column, with the exception of the "n"th column and the "m"th ridge within each column, with the exception of the last column, form interconnecting ridges, where the "m"th ridge in each column, with the exception of the last column, is connected electrically with the first ridge of the next following column; and in that the resultant junctions between said first and said second metal layers belonging to all conductive ridges in all columns form said series of electrically interconnected junctions.

45. A detector according to Claim 44, **characterised** in that adjacent columns include therebetween an electrically conductive surface section; in that said electrical interconnection between an "m"th ridge of a column and a first ridge in an adjacent column is effected through said conductive surface section; and in that said conductive surface section is connected electrically with interconnecting ridges belonging to adjacent columns but electrically insulated from said adjacent columns in other respects.

46. A detector according to Claim 40, **characterised** in that the series of conducting ridges form a series-connected thermocouple; in that the metal layer and a first or a second side surface of a first conducting ridge or a conductive surface adjacent said first conductive ridge in said series of

conductive ridges form a first thermocouple-connecting electrode; and in that a first or a second side surface of a last conductive ridge or a conductive surface adjacent said last conductive ridge in said series of conductive ridges forms a second thermocouple-connecting electrode.

47. A detector according to Claim 40, **characterised** in that the upper surface of respective conductive ridges is covered with a heat-absorbent layer; and in that said intermediate conductive surfaces are covered with a heat-reflecting layer.

48. A detector according to Claim 47, **characterised** in that said heat absorbing layer is a layer of carbon; and in that said heat-reflecting layer is comprised of said metal layer(s).

49. A detector according to Claim 41, **characterised** in that the metal in one of said ~~two~~ metal layers has a first reflection coefficient in relation to said light rays, or electromagnetic waves, that the metal in the other of said two metal layers has a second reflection coefficient in relation to said light rays, or electromagnetic waves, and that said detector-associated surface parts are positioned relative to incident light rays, or electromagnetic waves, so that the metal with the lowest reflection coefficient of said two reflection coefficients is the metal covering the side surface that will face said incident light rays, or electromagnetic waves.

50. A detector according to Claim 30, **characterised** in that the metal of said first metal layer is different from the metal of said second metal layer, such as to obtain a thermoelectric effect between said first and said second metal layers.

51. A detector according to Claim 50, **characterised** in that said two metal layers are comprised of gold covering chromium.

52. A detector according to Claim 28, **characterised** in that said first cell part includes a surface section intended for two or more detectors.

a 53. A detector according to Claim 28 ~~or Claim 52,~~ **characterised** in that said second cell part includes a surface section intended for one or more detectors.

54. A Bolometer related detector-arrangement intended for detecting electromagnetic waves, such as infrared light rays, wherein a cavity (21), which can enclose a volume of gas (G) to be measured or evaluated, have a surface, or parts of a surface, that form wall-parts (21C, 21D, 21E) within said cavity (21) covered with one or more different metal layers with the intention of forming a surface which is highly reflective with regard to said electromagnetic waves, and wherein said detector (3) is formed onto an electrically non-conductive base structure; having a topographical structure; covered with an electrically conductive metal layer, **characterised** in that a part or section (2B) of said base structure (B) exposes said topographical structure, that this structure is formed as series-connected resistances and forms one part of said gas cell (21), that a second or further part (2A) is formed to enclose said cavity (21) and adapted to cover said part (2B) having said topographical structure and that a base structure related area outside said topographical structure is used for circuit arrangements and/or discrete components (1a, 1b and 3).

Sub B3

add C2